



FAA Air Transportation Centers of Excellence Center of Excellence for Airport Technology (CEAT)

**James R. White, Deputy Director
FAA Office of Airport Safety and Standards**

**David A. Lange, CEAT Director
University of Illinois at Urbana-Champaign**



**Air Transportation Centers of Excellence
4th Joint Annual Meeting
Orlando, Florida
March 13-15, 2005**



Overview

- **History and Background**
- **Organization and Funding Structure**
- **Faculty, Staff and Students**
- **Current Projects**
 - **Airport Pavement Technology**
 - **Airport Safety Technology**
 - **Outreach**
- **New affiliation with OMP**
- **Future Plans**

History and Background





History and Background



- **Oldest of current 5 Centers of Excellence**
 - Established in 1995 as the *FAA Center of Excellence for Airport Pavement Research*.
 - Supported by the FAA Airport Technology R&D Branch, AAR-410.
 - Name changed in 2001 to *Center of Excellence for Airport Technology* to reflect the addition of Airport Safety (WHAS) research.
- **First competitively established COE**



History and Background

- **Phase 1 (1995 through 1999)**
 - Concentrated on basic research activities.
 - Research activities during first 3 years resulted in 9 final research reports and many other technical publications.
- **Phase 2 (1999 - 2005)**
 - Emphasizes research in support of National Airport Pavement Test Facility (NAPTF) activities.
 - Expanded to include Airport Safety research activities.
- **Next Phase**
 - New FAA 5-year cooperative agreement in preparation.
 - New support from outside FAA (OMP Partnership).
 - Expanded to include RPI Lighting Research Center.



Organization and Funding Structure

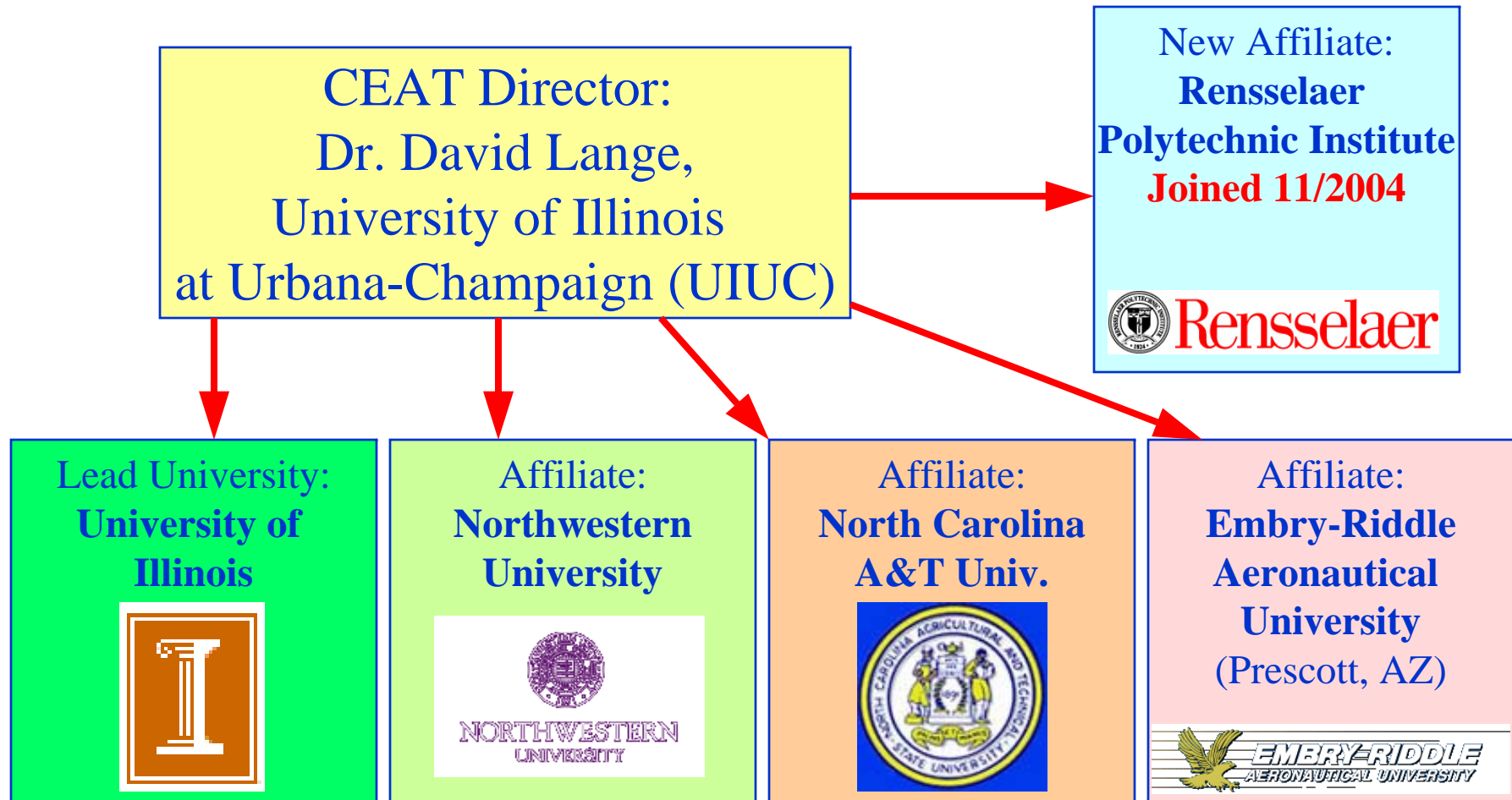




Organization - FAA Side

- **Airport Technology R&D Branch, AAR-410**
Manager, Dr. Satish K. Agrawal
 - ➔ **FAA COE PM: Dr. David R. Brill, AAR-410 (Airport Pavement)**
 - ➔ **Technical Monitors:**
 - ➔ **Dr. Michel Hovan (Wildlife Hazard Mitigation)**
 - ➔ **Ryan King (Airport Surface Technology)**
 - ➔ **Donald Gallagher (Airport Lighting)**
- **Airport and Aircraft Safety Division, AAR-400**
Division Manager, Pat Lewis
 - ➔ **FAA COE Program Director: Dr. Patricia Watts**
- **Office of Airport Safety and Standards, AAS**
Director, David L. Bennett (FAA Research Sponsor)

Organization - COE Side





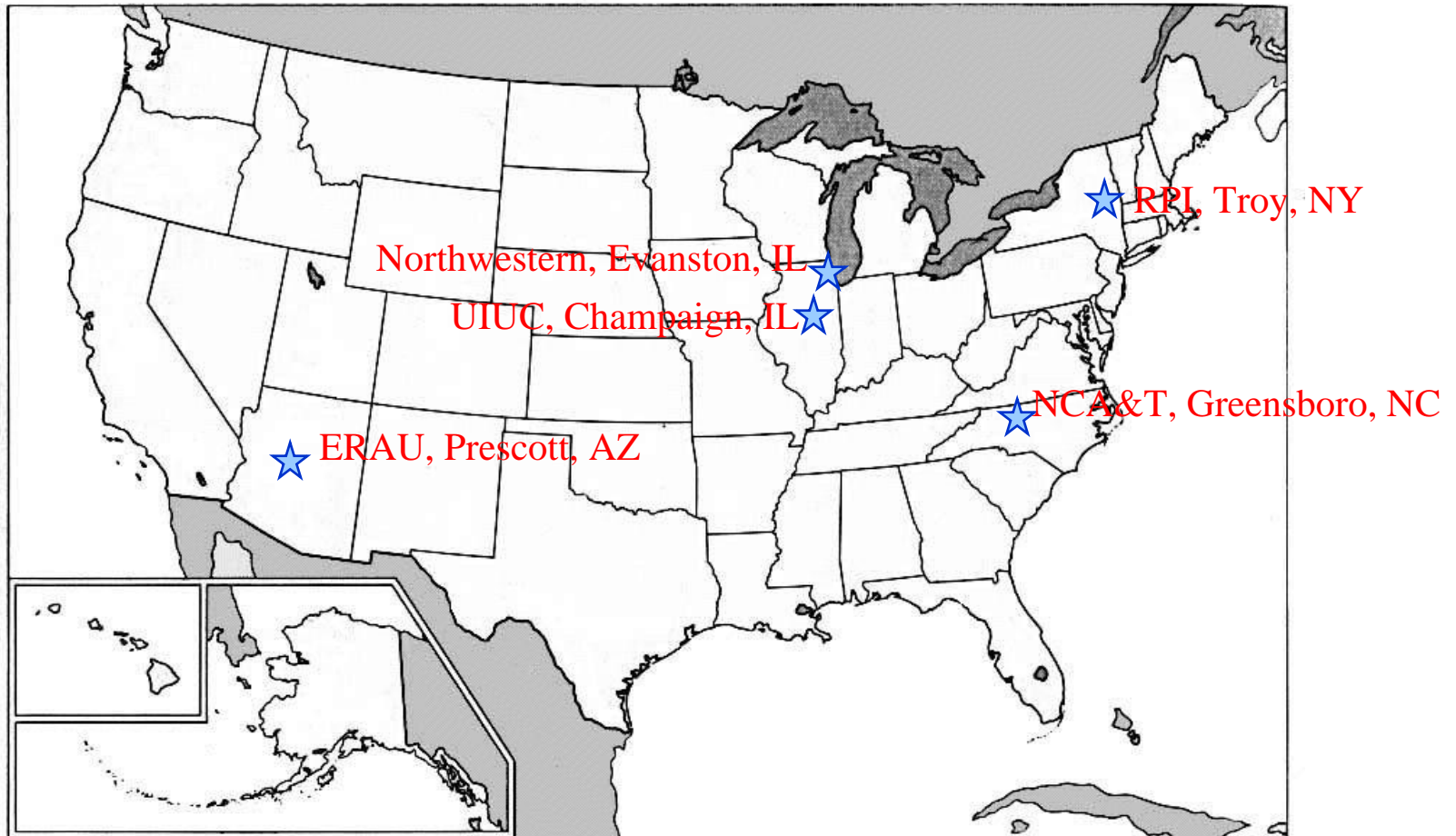
New Affiliate: Rensselaer Polytechnic Institute



- Rensselaer Polytechnic Institute (RPI) became the newest affiliate of CEAT in November 2004.
- RPI's Lighting Research Center (LRC) is the leading university-based research center devoted to lighting.
- Director and P.I.: Dr. Nadarajah Narendran.
- Starting in FY05, RPI will work on developing and investigating new technologies for airport visual guidance including:
 - LEDs
 - Tungsten Halogen



Geographic Distribution



* Outline map of USA used by permission of the University of Texas Libraries, The University of Texas at Austin.



Funding Structure

- All FAA funding to date has been in the form of 1-for-1 matched grants.
- Matching funds are primarily in the form of university funding.
- Since 1995, FAA awards to Airport Technology COE total \$4.7 M.



What FAA and COE Each Bring “To the Table”



- **FAA:**
 - ➔ **Funding source**
 - ➔ **Unique full-scale test data from National Airport Pavement Test Facility (NAPTF)**
- **COE:**
 - ➔ **100% matching funds**
 - ➔ **Recognized expertise in a variety of areas**
 - ➔ **Access to experimental facilities**
 - ➔ **Next generation of airport researchers**



Faculty, Staff and Students



COE Faculty Members

- Director: Dr. David Lange, UIUC
- Research Faculty (P.I.'s):



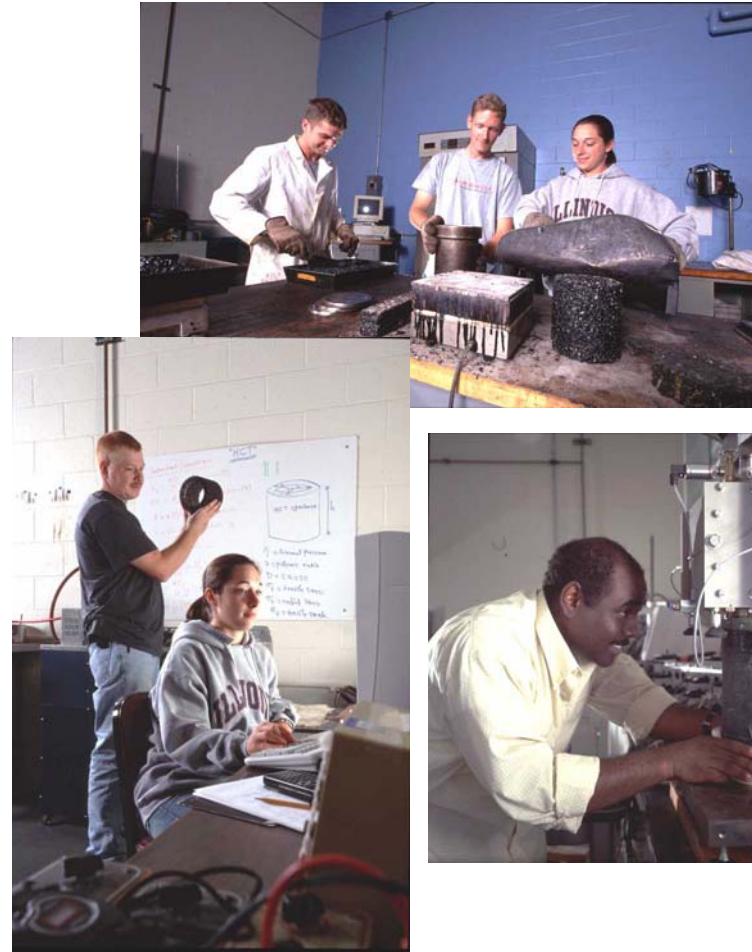
- ➔ Pavements area (10):

D. Lange; S. Carpenter; J. Roesler; W. Buttlar; E. Tutumluer; B. Dempsey; I. Al-Qadi; M. Thompson; E. Barenberg (UIUC); S. Shah (Northwestern)

- ➔ Wildlife Safety area (7):

E. Herricks (UIUC); A. Dickey (ERAU); D. Schaeffer, P. Mankin, R. Larkin, R. Warner, P. Chen (UIUC)

- **24 Ph.D. dissertations completed to date.**
- **Currently, 10 Ph.D. students are assigned to COE research projects.**
- **HBCU summer program.**



Research Facilities

- **Newmark CE Lab**
 - ➔ Department home
- **ATREL (Advanced Transportation R&E Laboratory)**
 - ➔ Laboratory Facilities
 - ➔ Fmr. Chanute AFB
 - ➔ Adv. Transportation Loading System (ATLaS)
- **Center for Advanced Cement-Based Materials** (Based at Northwestern, includes UIUC)



Research Facilities

ATLaS



ATREL

Current Projects

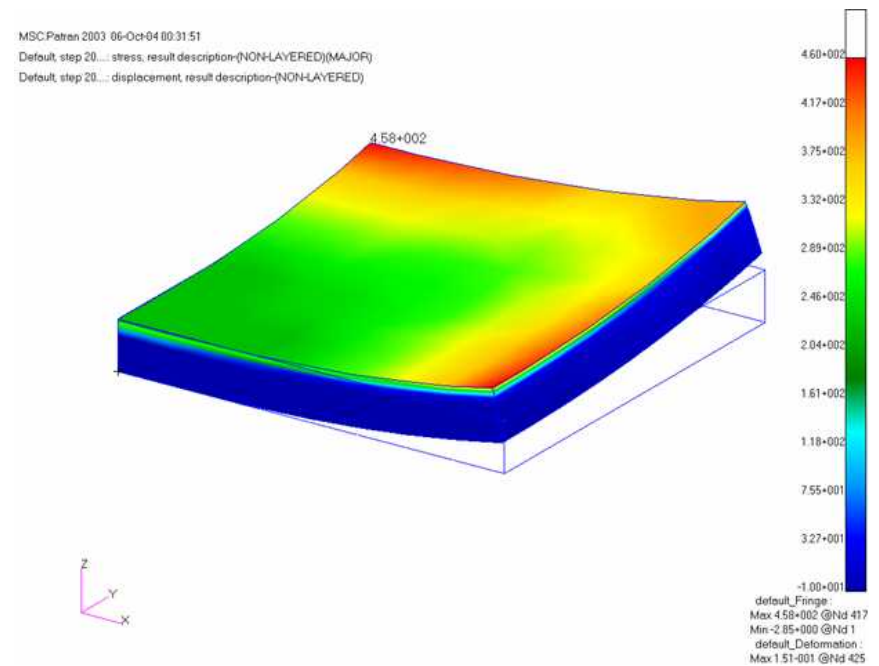
Airport Pavement Technology



Airport Pavement Projects

Project: Moisture Curing of Concrete Slabs for Airfield Applications

- *P.I.s Dr. David Lange & Dr. Jeffery Roesler, UIUC*
- *Expected completion: 2005*
- *Product: Better Practices for Limiting Concrete Slab Uplift and Related Distresses*
- **Benefit: Improved tools for material selection lead to longer pavement life.**
- *FAA funds in FY 2004: \$75K*



Airport Pavement Projects

Project: Permanent Deformation Behavior of Airport Pavement Granular Layers

- *P.I. Dr. Erol Tutumluer, UIUC*
- *Expected completion: 2005*
- *Product: New Test Method for Granular Materials Applicable to Airport Loads*
- **Benefit: Life Cycle Cost Savings**
- *FAA funds in FY 2004: \$34K*



“Fast-Cell” Testing Apparatus

Airport Pavement Projects

Project: Fatigue Resistance of Airport Concrete Pavements

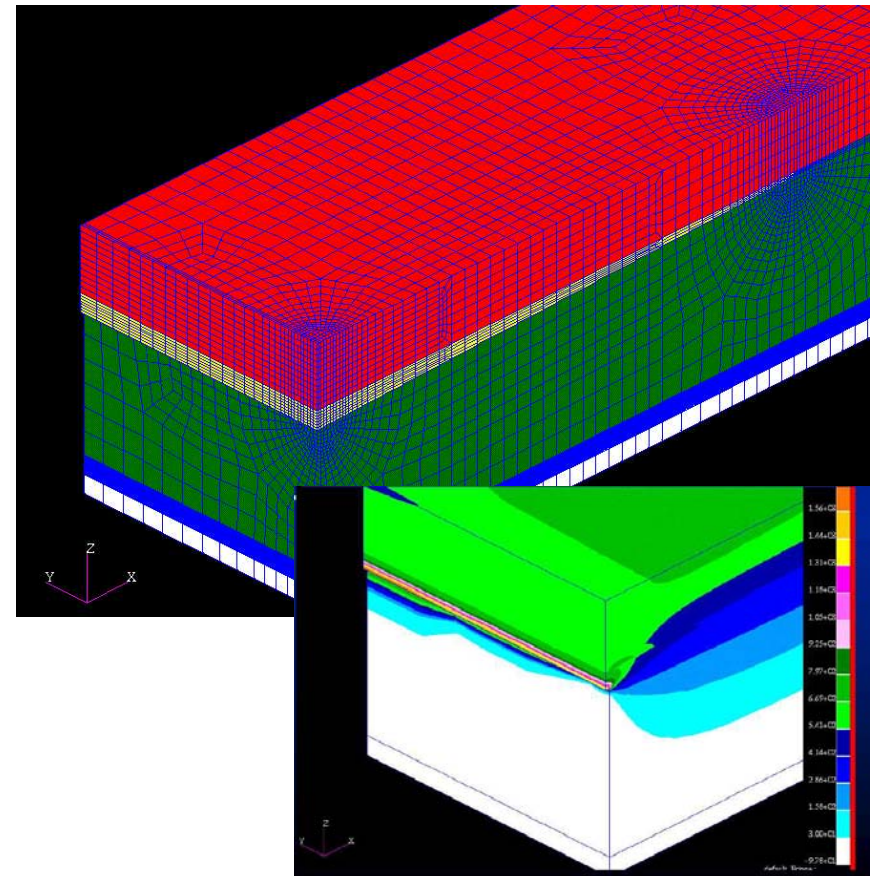
- *P.I.s Dr. Jeff Roesler, UIUC, and Dr. Surendra Shah, Northwestern University*
- *Expected completion: 2005*
- *Product: Improved Traffic Models for FAA Airport Pavement Design for Large Aircraft*
- *Benefit: **Life Cycle Cost Savings***
- *FAA funds in FY 2004: \$55K*



Airport Pavement Projects

Project: Analysis of Flexible Overlay Systems for Airport Pavements

- *P.I. Dr. Bill Buttlar, UIUC*
- *Expected completion: 2005*
- *Product: Recommendations to Improve FAA LEDFAA Asphalt Overlay Design Methods*
- *Benefit: **Extended Overlay Life***
- *FAA funds in FY 2004: \$46K*



Airport Pavement Projects

Project: Energy Concepts for Fatigue Analysis of Airport Pavements

- *P.I. Dr. Sam Carpenter, UIUC*
- *Expected completion: 2006*
- *Product: Improved Asphalt Fatigue Model for LEDFAA Pavement Design*
- *Benefit: **Better asphalt life prediction leads to life cycle savings***
- *FAA funds in FY 2004: \$34K*



Current Projects

Airport Safety Technology

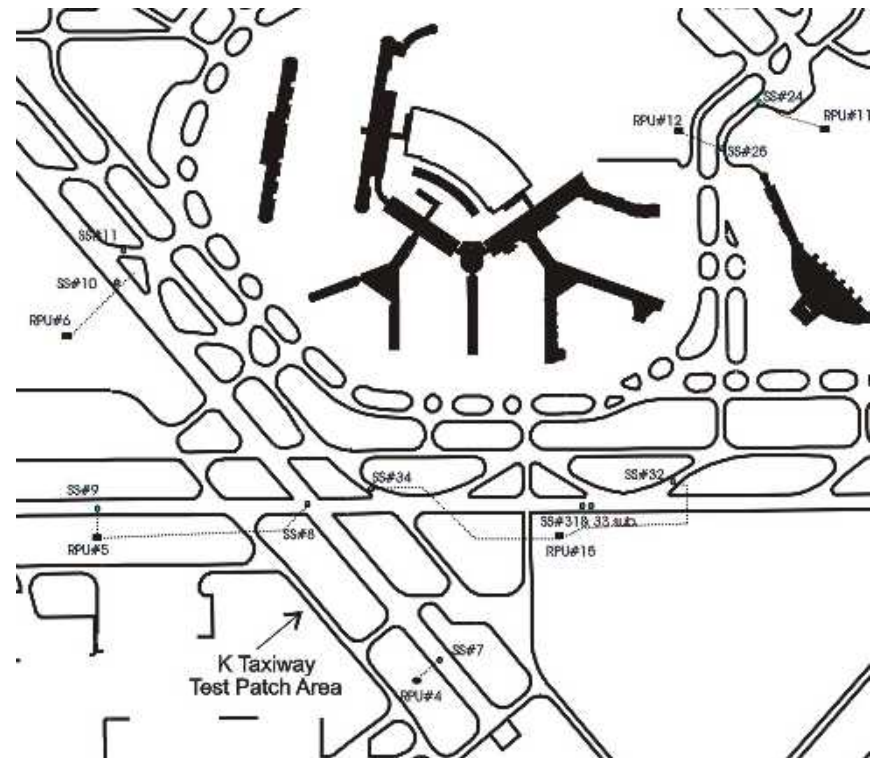
Runway and Taxiway Surface Technology



Anti-Icing Overlay Testing

Project: Anti-icing Coating Study at Chicago O'Hare International Airport

- *P.I. Dr. Barry Dempsey, UIUC*
- *Expected completion: 2005*
- *Objective: Monitor test bed on T/W K with anti-icing overlay*
- *Product: Performance data for innovative pavement surface.*
- ***Benefit: Improved winter safety performance***
- *FAA funds in FY 2004: \$75K*



Current Projects

Airport Safety Technology
Wildlife Hazard Abatement Systems (WHAS)



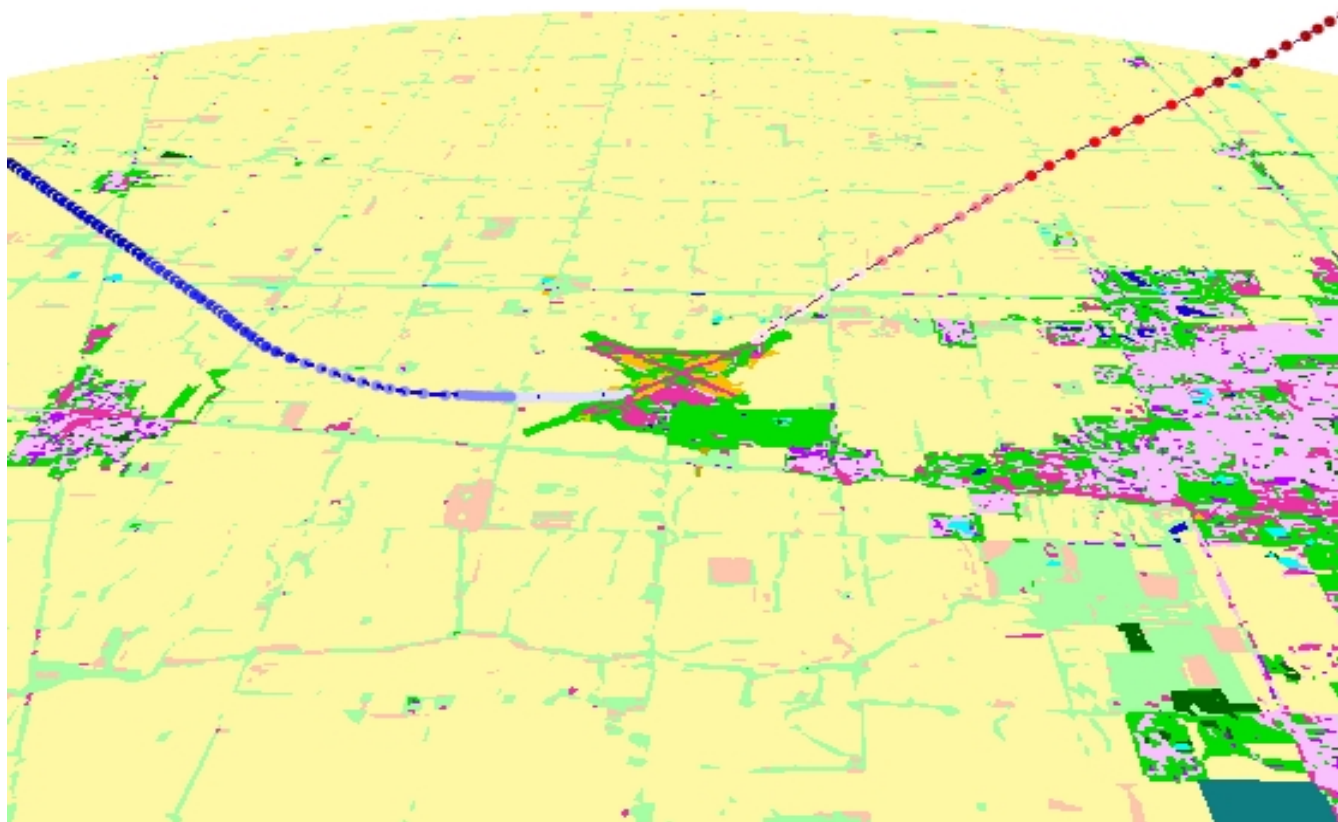


Current Projects - Wildlife



- ***Wildlife Hazard Abatement Systems (WHAS)***
P.I.: Dr. Edwin Herricks, UIUC
co-P.I.: Dr. Archie Dickie, ERAU Prescott
- **UIUC Wildlife Strike Mitigation Team:**
 - Dr. Dave Schaeffer (Risk Assessment)**
 - Dr. Phillip Mankin (Field Operations)**
 - Dr. Ron Larkin (Radar Applications)**
 - Dr. Richard Warner (Deer Management)**
 - Dr. Peter Chen (Modeling)**

3-D Representation of Bird Strike Risks





WHAS Research Activities



- Improve airport wildlife management techniques.
- Develop a dynamic GIS-based information system
- Participate in the development of an Real-Time Bird Strike Advisory System.
 - This system will use airport radars as the primary detection mode.



Airport Wildlife Hazard Mitigation



William J. Hughes FAA Technical Center



- **Embry-Riddle University at Prescott, AZ**
 - **P.I. Dr. Archie Dickey**
- **Establishment and maintenance of the FAA Wildlife Strike Mitigation Website:**
<http://wildlife-mitigation.tc.faa.gov>
- **Development of user-friendly interface to process and analyze wildlife strikes in the U.S.**

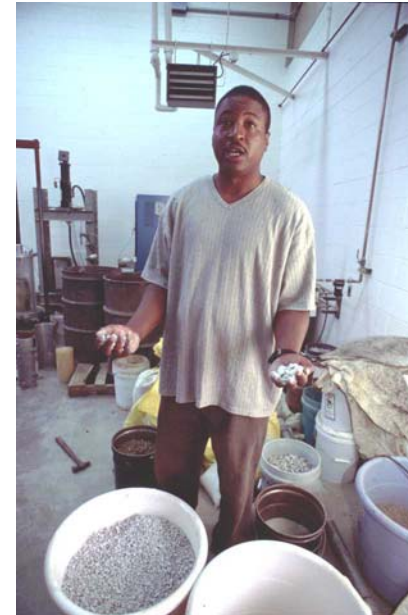
Current Projects

Outreach





COE Outreach Activities



HBCU Summer Internship Program
2001 - 2002 - 2003 - 2004

Current Projects - Outreach

- **Minority Summer Internship Program**
 - Supports 5-7 HBCU students at UIUC for 12 week internship.
 - The goal is to increase the number of under-represented minorities obtaining advanced degrees in civil engineering.
 - Success rate: 3 former interns from 2001 and 2002 have gone on to enroll in graduate studies at UIUC (2 Ph.D. & 1 M.S.).



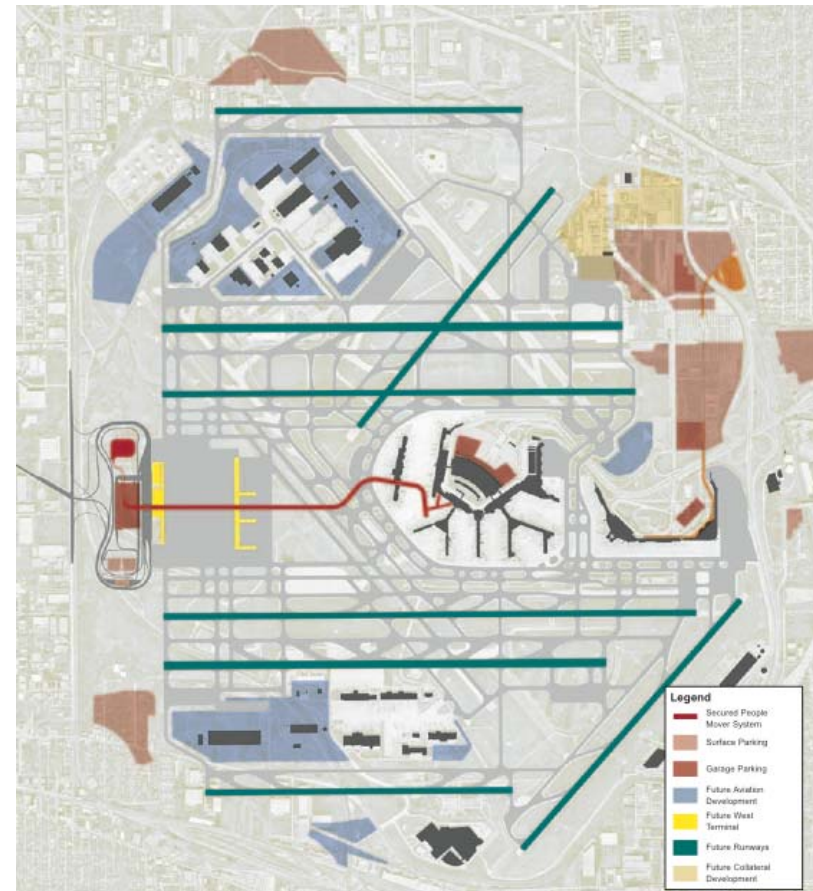


New Affiliation with the O'Hare Modernization Program (OMP)



Overview of OMP

- **\$6.6B program**
 - 35 miles of runways, taxiways
 - 2.2M cu yds of PCC
 - 29M cu yds of earthwork
- **Modern, parallel runway configuration**
- **Massive earthmoving, construction, hydraulic, environmental impact challenges**





OMP Sponsorship

- **A City of Chicago organization**
- **OMP sponsorship started October 2004**
- **Scope of research program: \$384,000 for first year**
- **Technical objectives**
 - **Research in support of OMP construction**
 - **Illuminate technical issues at O'Hare**
 - **Improve basis for decision-making**
 - **Lead to cost-effective solutions**
- **Outreach objectives**
 - **Serve broader needs, beyond physical infrastructure**
 - **Support advancement of traditionally underrepresented groups in engineering and construction**



OMP Research Projects

- **Subgrade stabilization -- Erol Tutumluer & Marshall Thompson**
 - Huge earthmoving operation is anticipated
 - Lime stabilization required to achieve to achieve stiffness
- **Raw Materials -- Leslie Struble**
 - Aggregate quality
 - Mineral admixture availability and characteristics
 - Cement characteristics
- **PCC Pavement -- Jeff Roesler & David Lange**
 - Reduction of shrinkage, avoidance of curling
 - Saw-cut timing
 - Joint behavior: aggregate interlock vs. dowel bar

Future Plans





Future Plans

- **CEAT is the first Air Transportation COE to reach the 10-year milestone.**
- **FAA conducted a 10-year evaluation in 2004**
 - **Recommended continuation of COE.**
 - **FAA is currently developing a new Cooperative Agreement to operate Airport Technology COE for the next 5 years.**
 - **Expected to be in place April 2005.**



Visit the COE Web Sites



Center of Excellence for Airport Technology:

<http://cee.uiuc.edu/research/ceat/>

FAA Airport Technology R&D Branch:

<http://www.airporttech.tc.faa.gov/>

Air Transportation Centers of Excellence:

<http://www.coe.faa.gov/>